



Manned Spaceflight Operations

- Planning, Logistics and Communications -

Dieter Sabath, Gerd Söllner, Marius Bach

German Space Operations Center (GSOC)

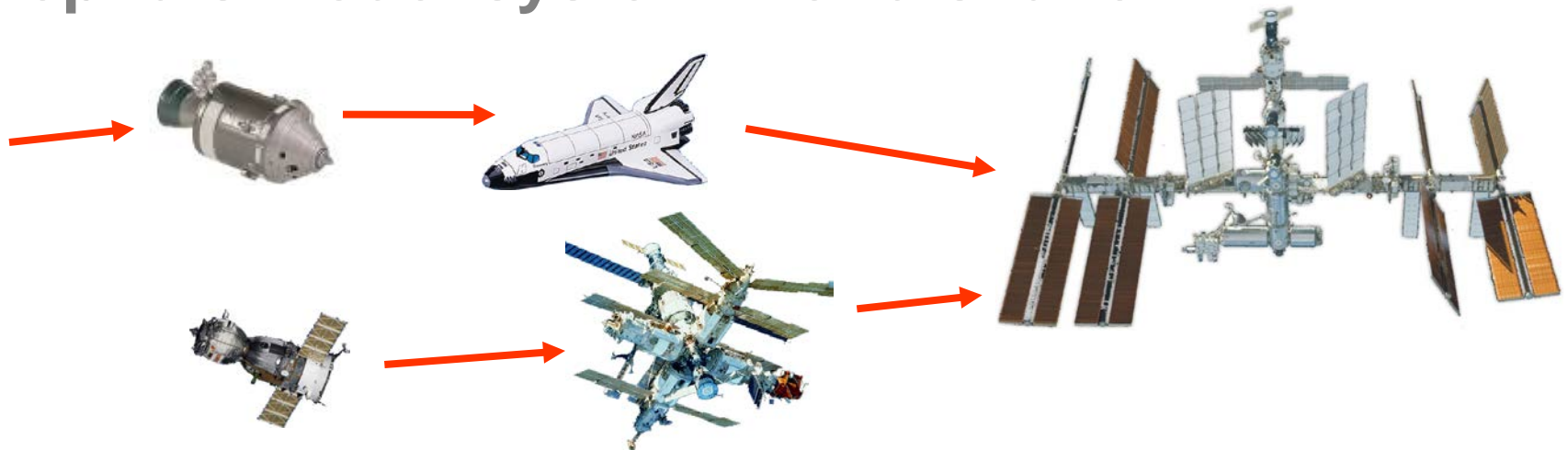
Deutsches Zentrum für Luft- und Raumfahrt (DLR), Oberpfaffenhofen



„Vorwort“

„*Das*“ Konzept für Operations gibt es nicht.
Aber einige grundlegende Überlegungen kann
man verallgemeinern.

Die ISS vereint die Ops-Erfahrung mehrerer
Raumfahrtprogramme, deswegen wird ihr Ops-
Konzept als Modellsystem hier diskutiert





Agenda

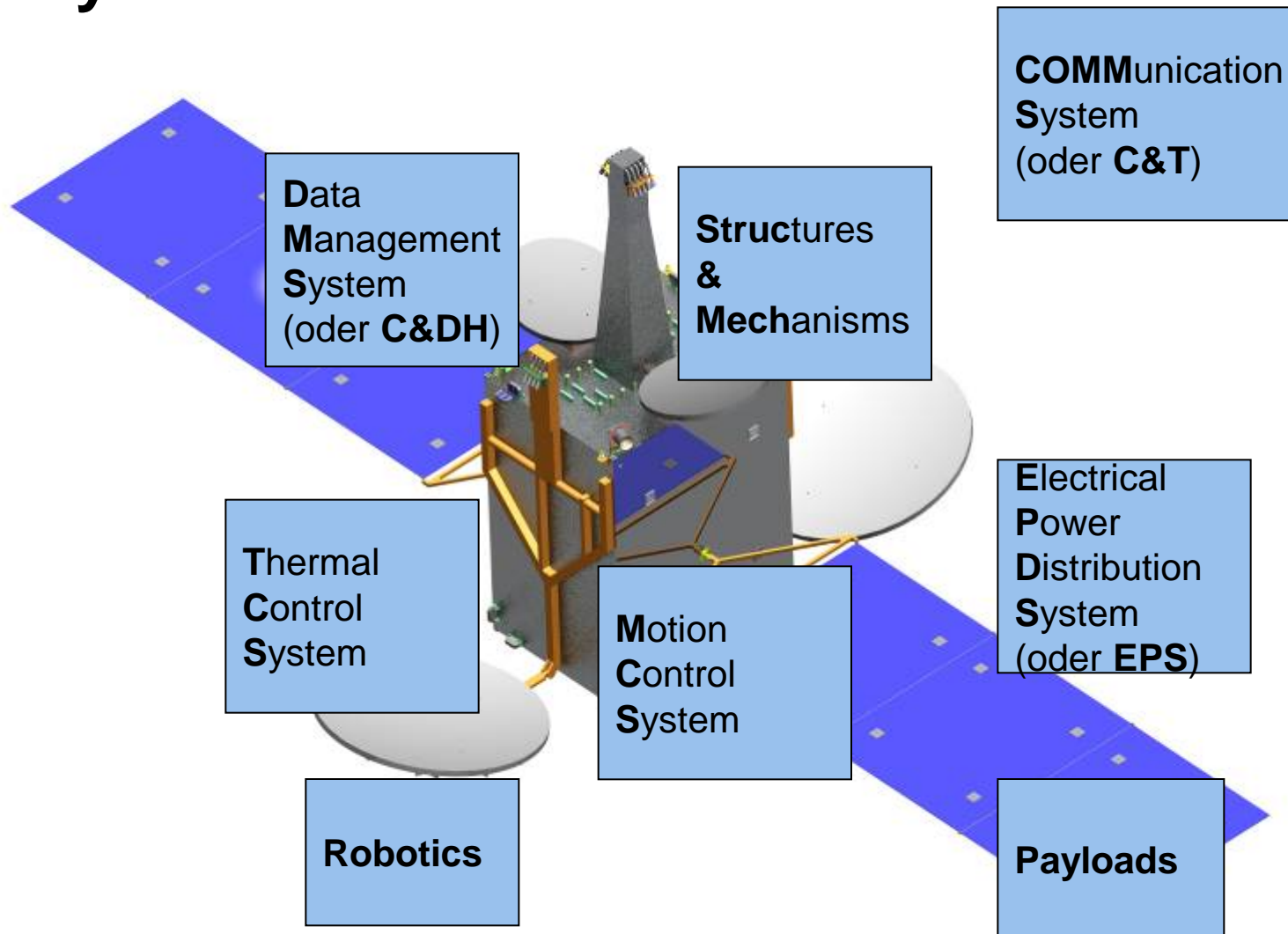
A repetition? - The Subsystems

The Flight Control Team

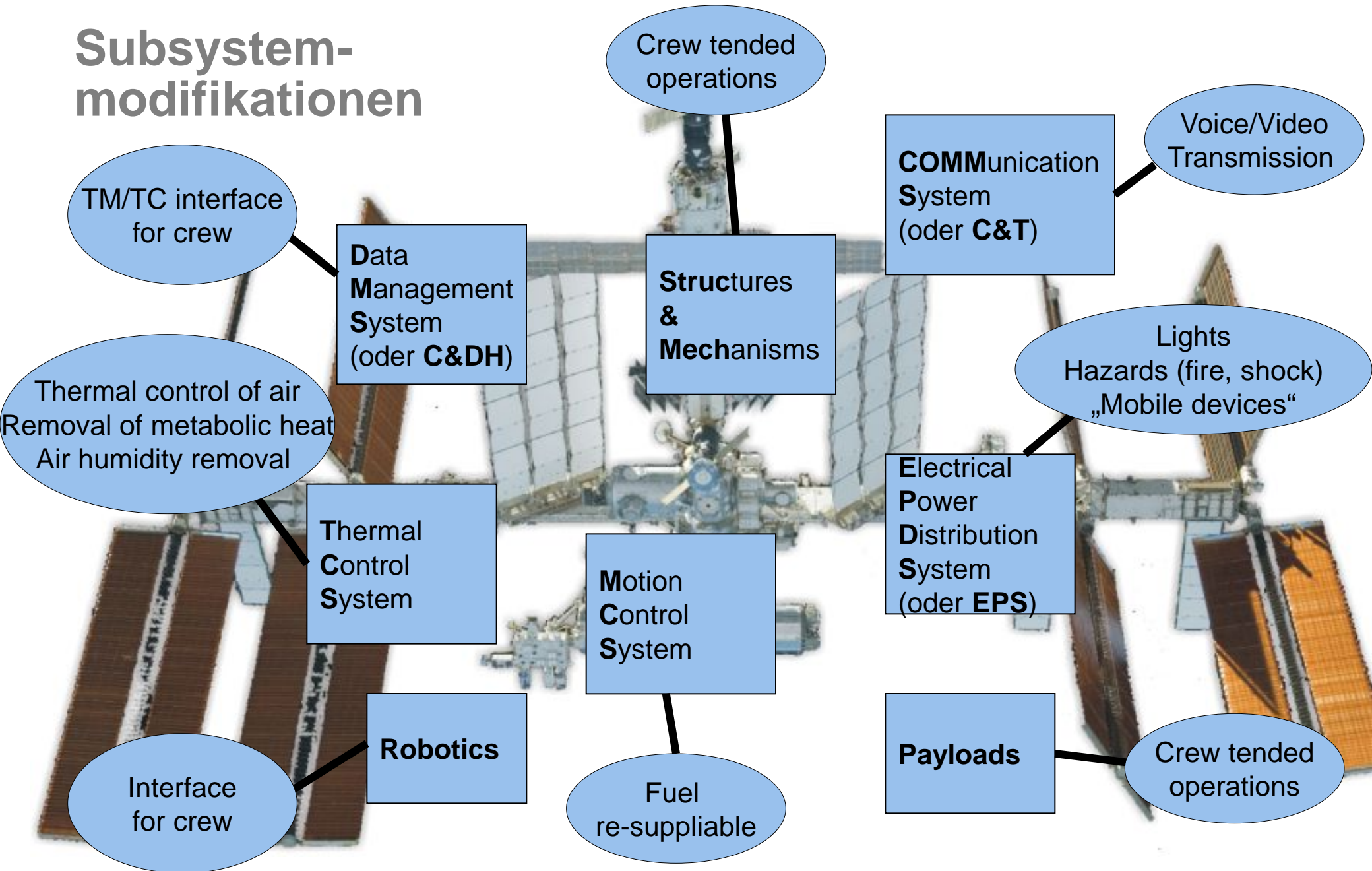
How to conduct Operations

The Crew and Mission Control

Subsysteme...



Subsystem-modifikationen



Zusätzliche Subsysteme für die Crew

**Environmental
Control and
Life
Support
System**

**Data
Management
System
(oder C&DH)**

**Structures
&
Mechanisms**

**COMMunication
System
(oder C&T)**

**In
Flight
Maintenance**

**Thermal
Control
System**

**Motion
Control
System**

**Electrical
Power
Distribution
System
(oder EPS)**

**Crew
Support
System**

**Extra
Vehicular
Activity**

Robotics

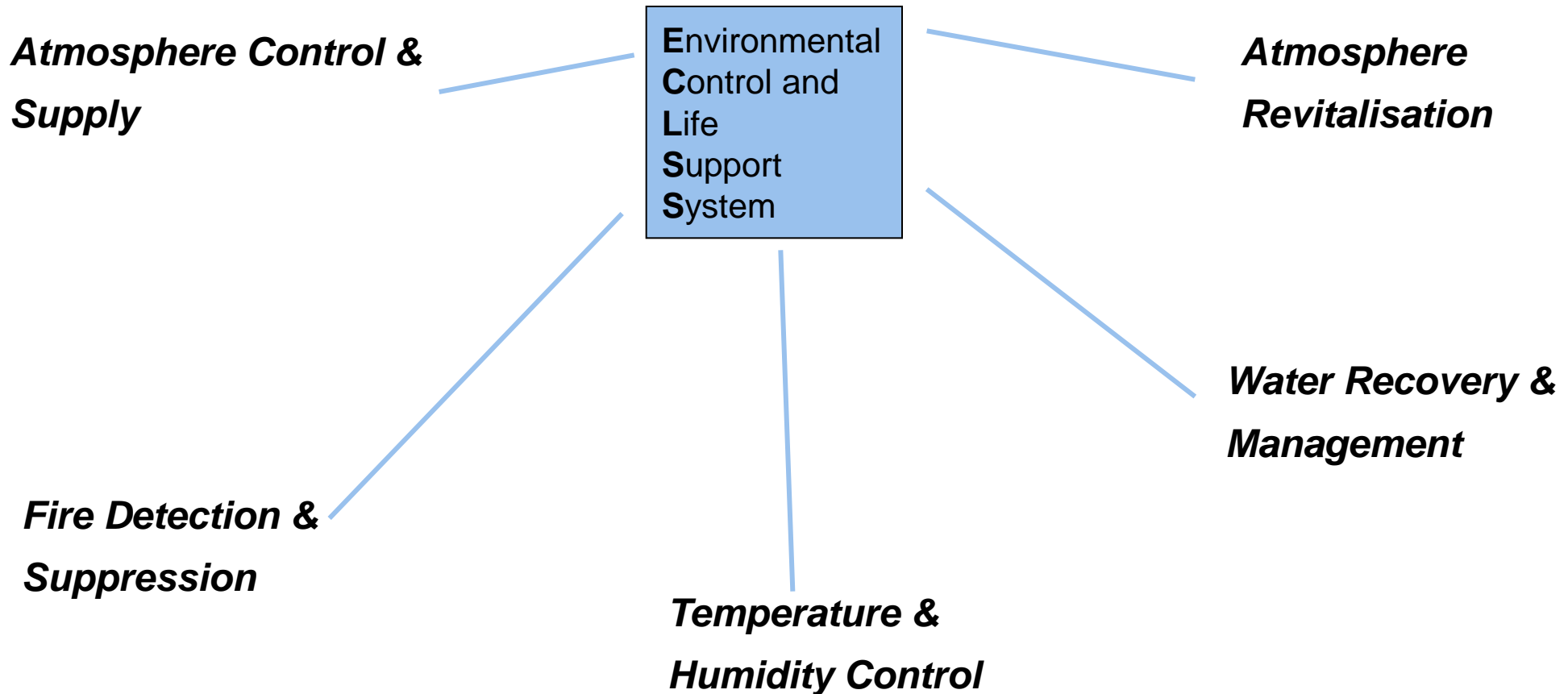
Payloads

**Medical
Ops**





ECLSS provides a habitable environment





Agenda

A repetition? - The Subsystems

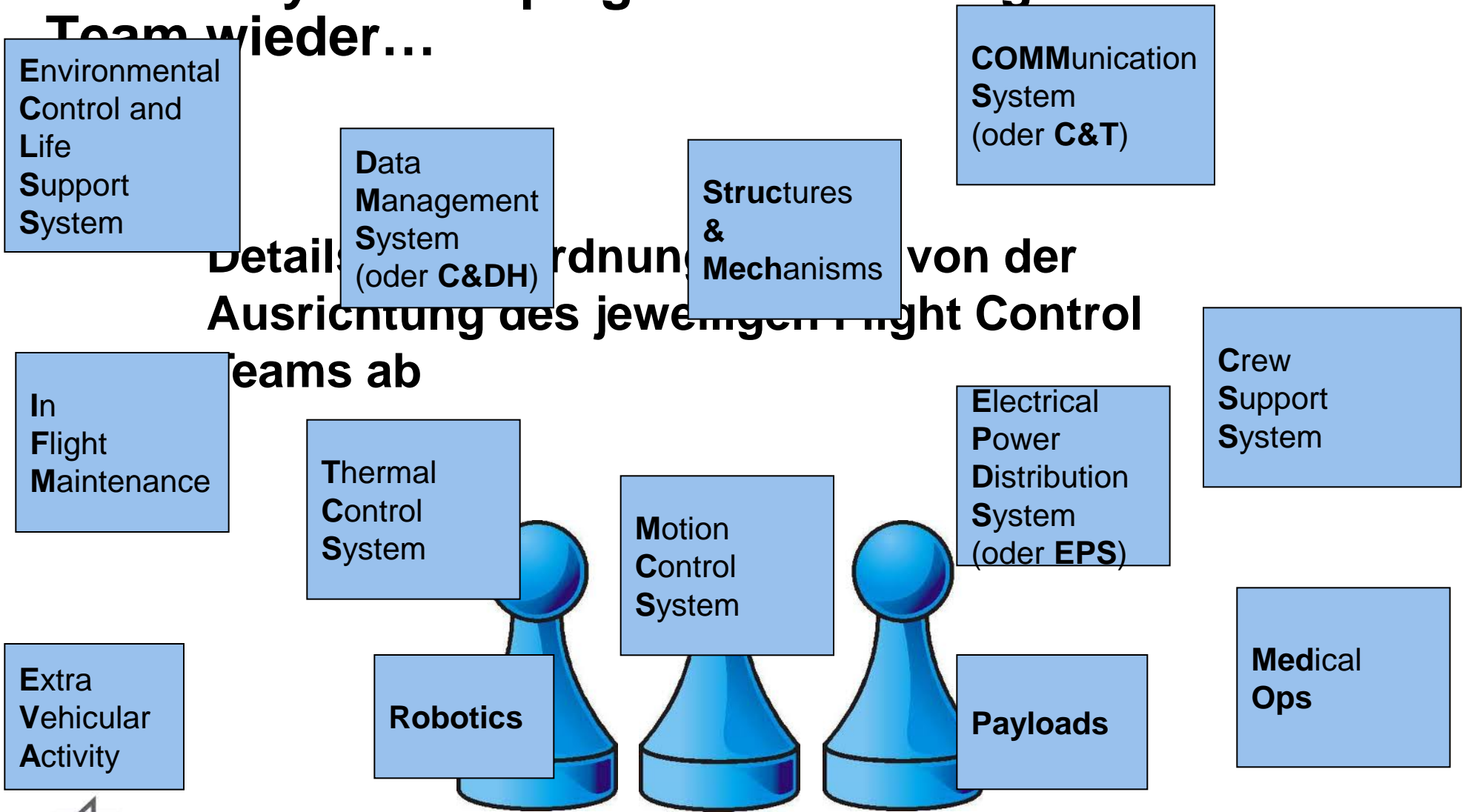
The Flight Control Team

How to conduct Operations

The Crew and Mission Control

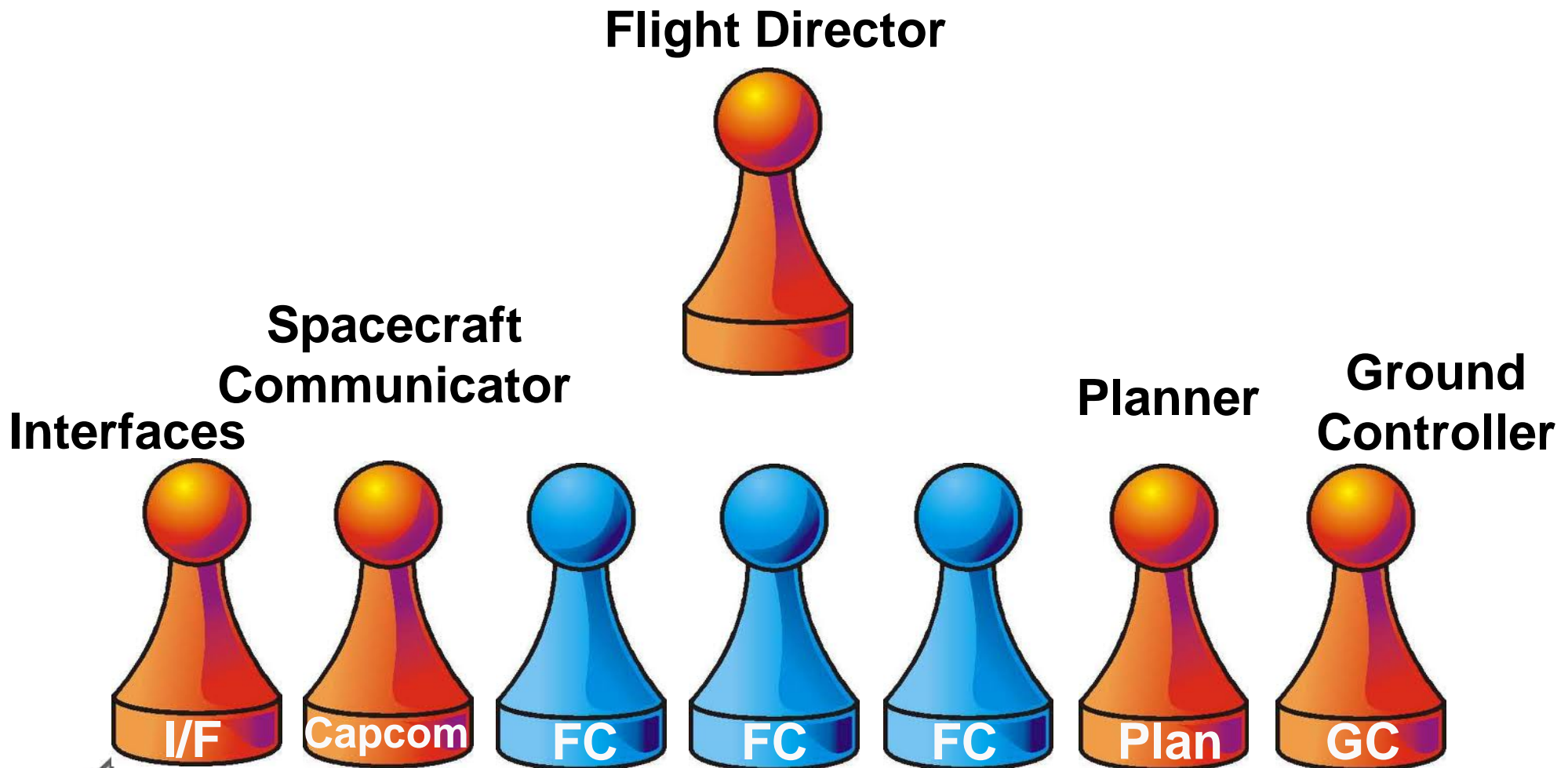


Die Subsysteme spiegeln sich im Flight Control Team wieder...





Jedes Flight Control Team hat weiterhin zusätzliche Funktionen





ISS-Kontrollzentren der NASA – „Großes“ Team

ADCO

GNC, MCS

OPSPLAN

Planner

ROBO

Robotics

PAO

Public outreach

OSO

Struc&Mech

ETHOS

ECLSS, iTCS

TOPO/VVO/RIO

Trajectory/Interface

CRONOS

C&T, C&DH

ISS FD

Flight Director

**CAP-
COM**

CIO

ISO

SPARTAN

EPS, eTCS

EVA

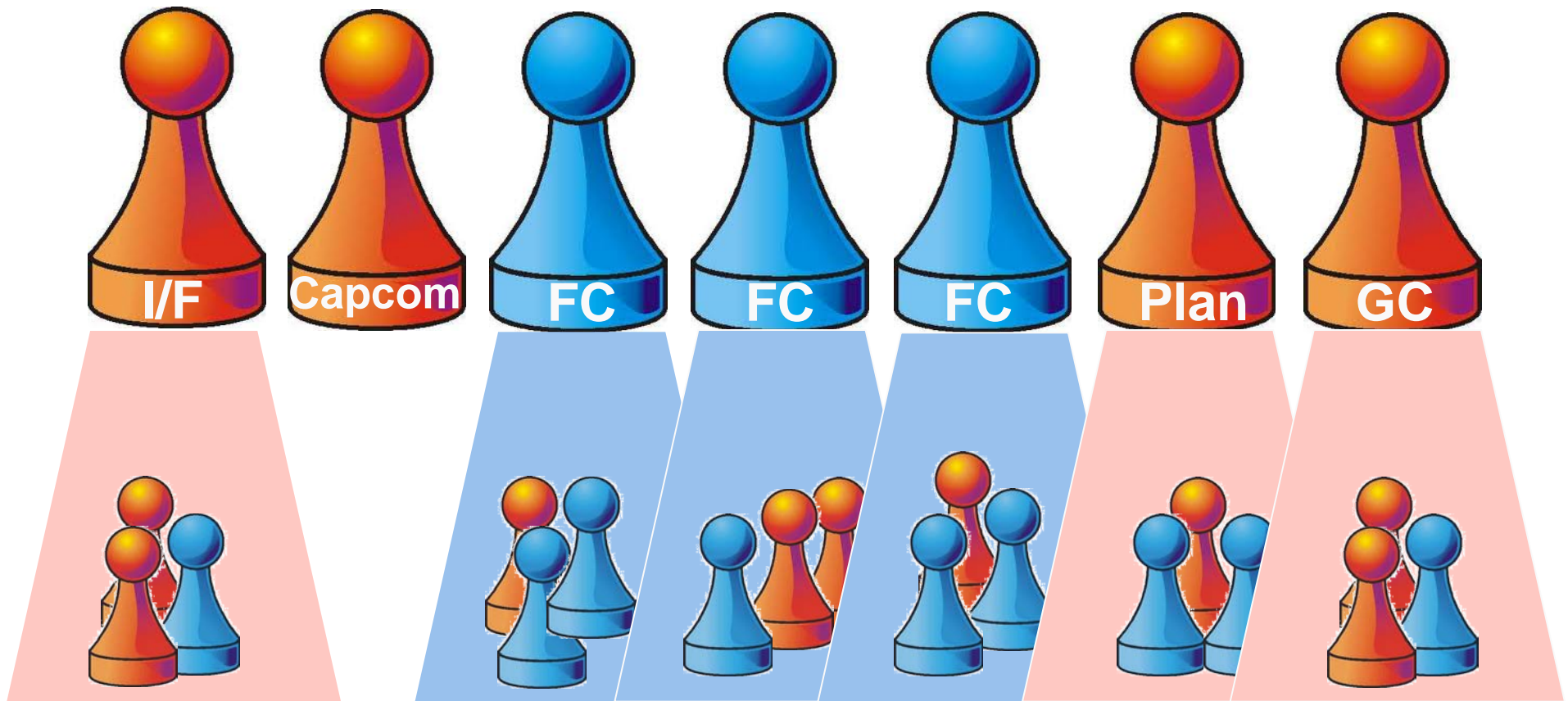
EVA

**BME
und Flugarzt**

GC

Ground Systems

Flight Control Positionen können einen Expertenstab hinter sich haben („Backroom“)



ISS-Kontrollzentren der NASA – „Backroom“ example



OPSPLAN
Planner



LRP
Long Range Planner

RPE
Replanning Engineer

RPE Support
Replanning Engineer

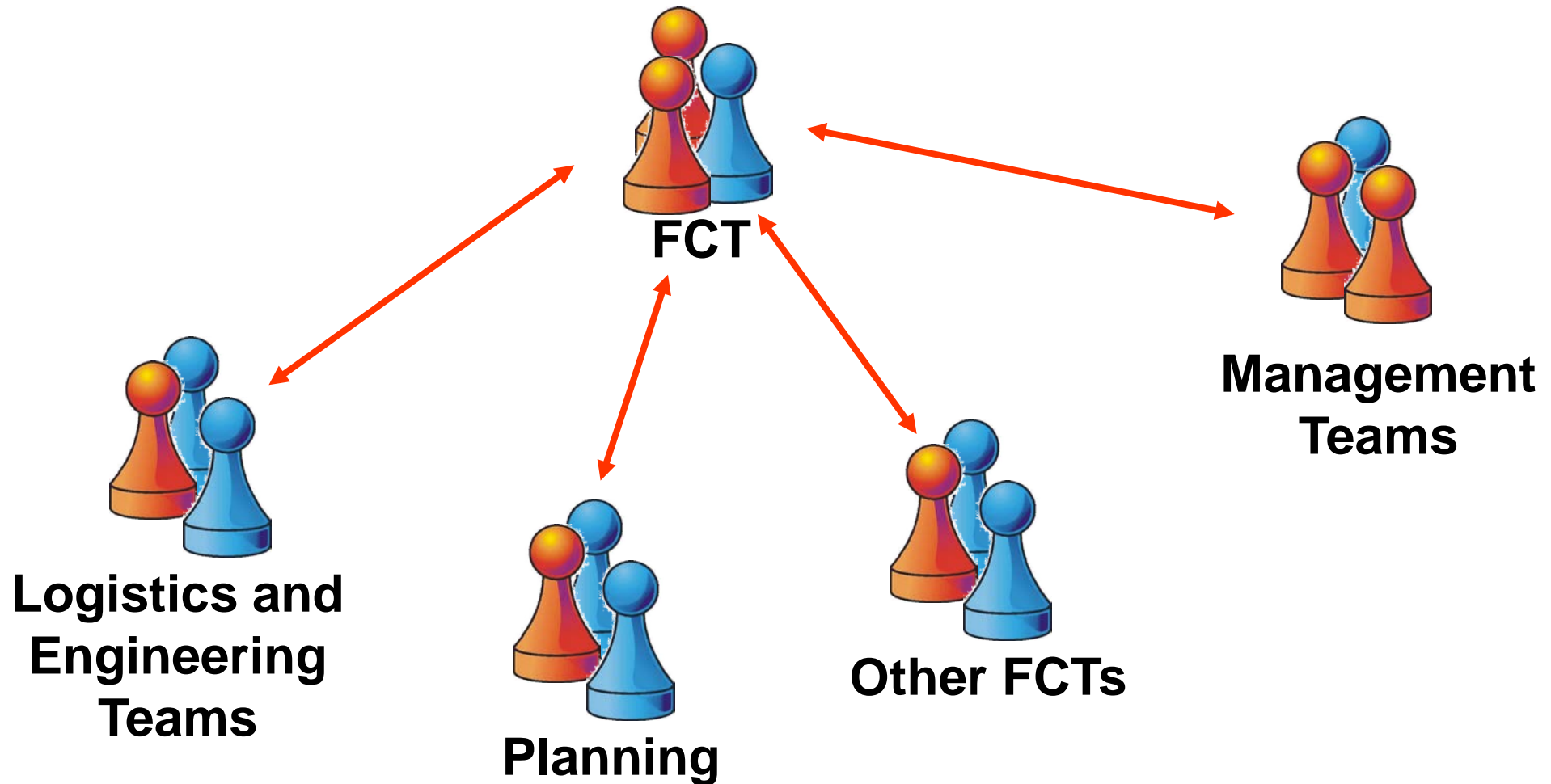
ODF
Ops Data File

Interpreter
Russian translations

OCA
Orbital Comm Adapter



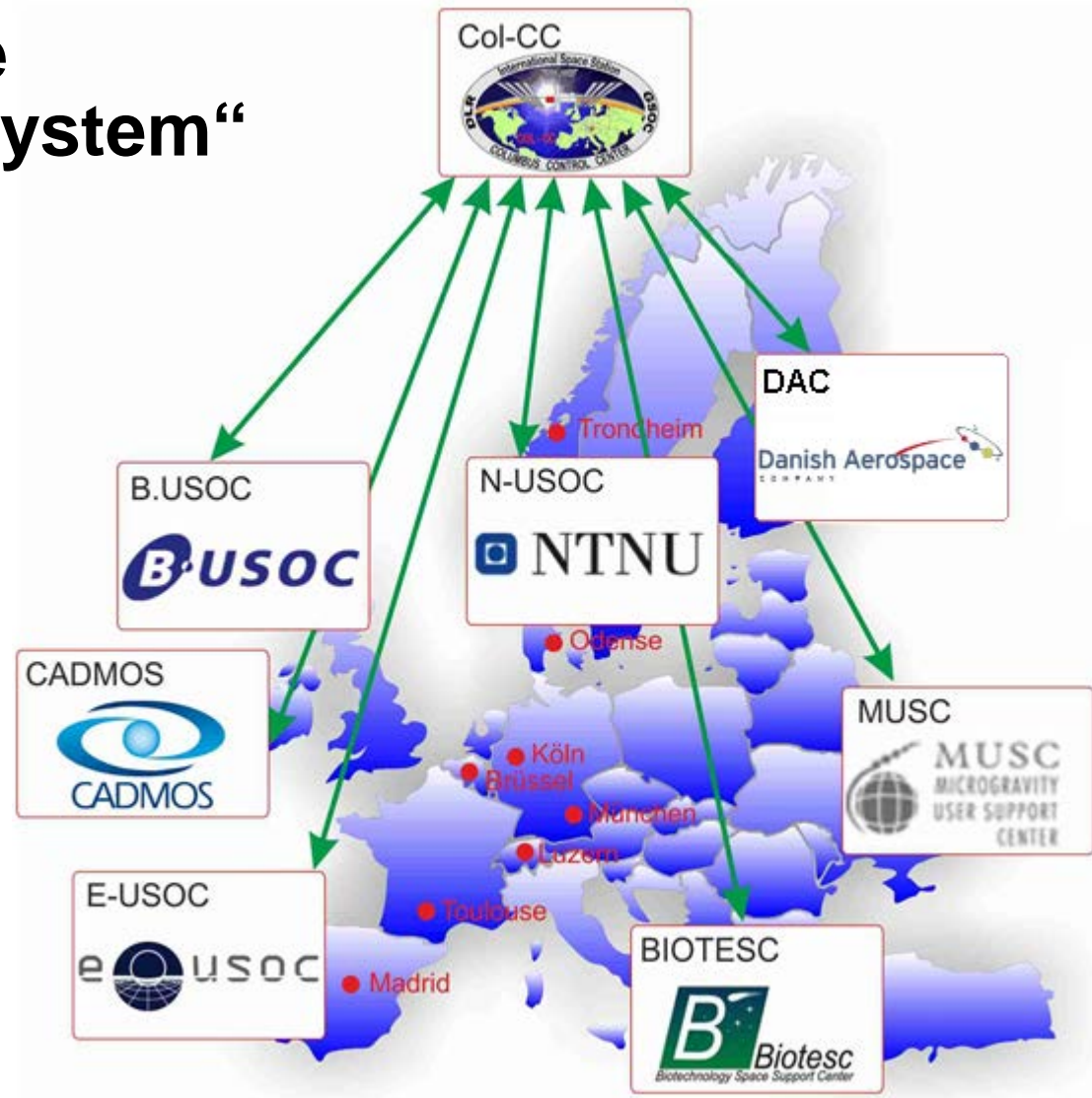
Andere Teams unterstützen das Flight Control Team



Die ISS-Hauptkontrollzentren



Das Europäische Flight Control „System“





ISS-Kontrollzentrum der ESA – Col-CC

STRATOS

C&DH, C&T,
ECLSS, EPS, TCS

COSMO

Struc&Mech, IFM, CSS

EUROCOM

„Capcom“

COL FD

Flight Director

COMET

Planner



Agenda

A repetition? - The Subsystems

The Flight Control Team

How to conduct Operations

The Crew and Mission Control





Wir züchten Kristalle...



D
Ü
S
E
N
T
R
I
E
B



Vorbereitungen auf Ingenieursseite



Konstruktion und
Dokumentation

Safety assessment

Verschiedene
Reviews

Software

Integration





Handover an das Operations Team

Stage Analysis

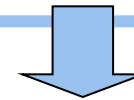
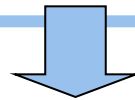
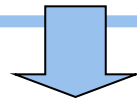
Welche gegenseitigen Wechselwirkungen gibt es?

Hazard Reports

Welche Gefahren gibt es?

Ops Handbooks

Wie funktioniert das Gerät?

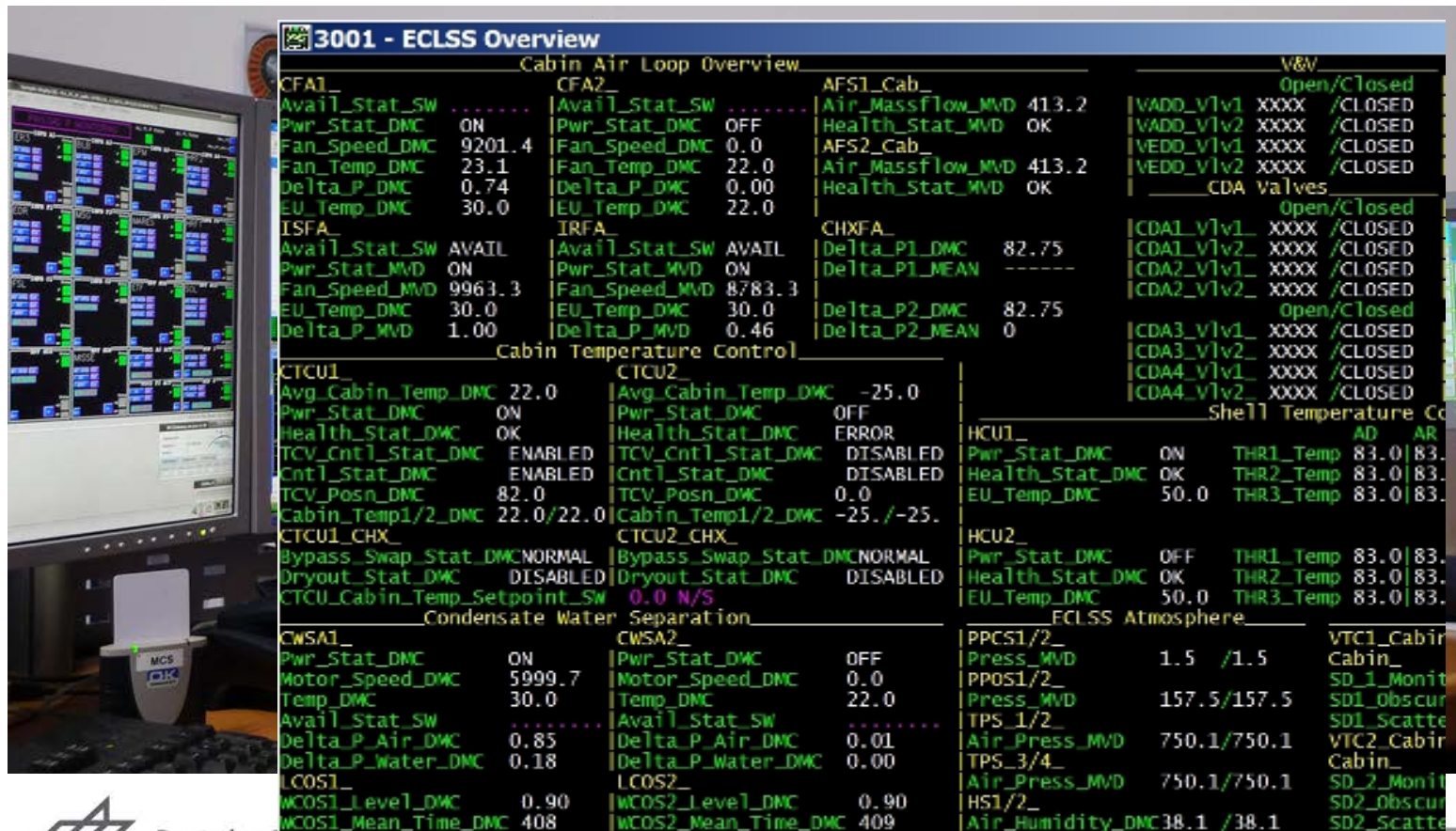


Operations Preparation



Telemetrie und Telecommanding

DÜSENTRIEB stellt Telemetrie zur Verfügung



Die Onboard-Software muss für das Experiment konfiguriert sein

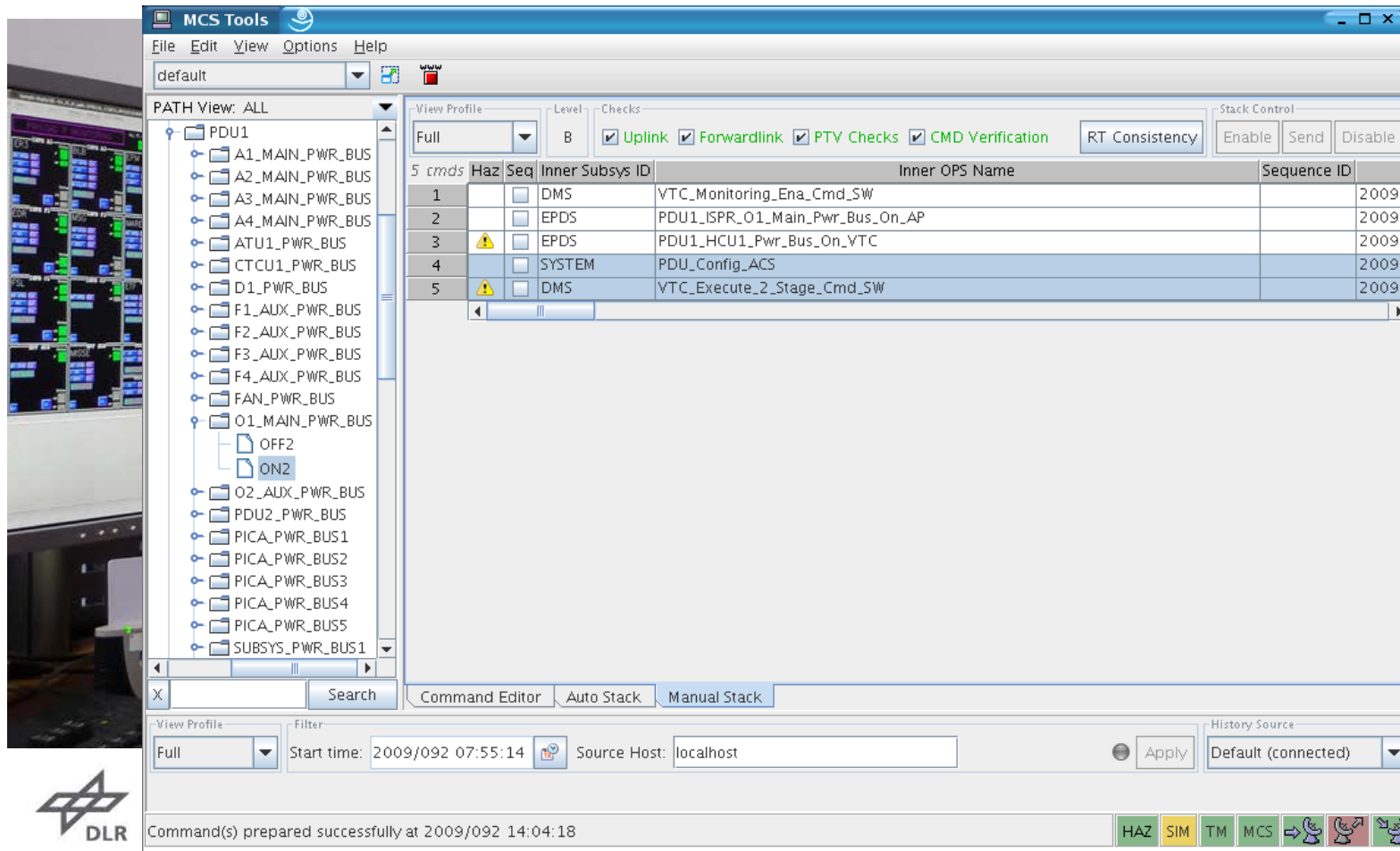
Die Mission Data Base am Boden muss konfiguriert sein

Telemetrie-Displays müssen entwickelt und getestet werden



Telemetrie und Telecommanding

DÜSENTRIEB kann vom Boden aus kommandiert werden



The screenshot displays the MCS Tools software interface. On the left, a tree view shows the system hierarchy under 'PDU1', including various power buses (A1, A2, A3, A4, ATU1, CTU1, D1, F1-F4, FAN, O1, O2, PDU2, PICA, SUBSYS). The main window shows a command sequence table with 5 commands. The 'View Profile' is set to 'Full', 'Level' is 'B', and several checks are enabled: 'Uplink', 'Forwardlink', 'PTV Checks', and 'CMD Verification'. The 'Stack Control' buttons are 'Enable', 'Send', and 'Disable'. The command sequence table is as follows:

Cmds	Haz	Seq	Inner Subsys ID	Inner OPS Name	Sequence ID
1			DMS	VTC_Monitoring_Ena_Cmd_SW	2009/092 07:55:14
2			EPDS	PDU1_ISPR_O1_Main_Pwr_Bus_On_AP	2009/092 07:55:14
3			EPDS	PDU1_HCU1_Pwr_Bus_On_VTC	2009/092 07:55:14
4			SYSTEM	PDU_Config_ACS	2009/092 07:55:14
5			DMS	VTC_Execute_2_Stage_Cmd_SW	2009/092 07:55:14

At the bottom, the 'Command Editor' tab is active, showing a filter set to 'Full', a start time of '2009/092 07:55:14', and a source host of 'localhost'. The status bar at the bottom indicates 'Command(s) prepared successfully at 2009/092 14:04:18'.

Kommandofiles müssen gebaut und getestet werden

Für jede Aktivität: Eine Prozedur...

DÜSENTRIEB muss
von den Astronauten in EDR
eingebaut werden.

Oder:

DÜSENTRIEB muss
vom Boden aus kommandiert
werden

1.101 COL VIDEO CASSETTE RECORDER SERVICING (IFM/1E-ALL/FIN) Page 1 of 4 pages

OBJECTIVE:

Perform a routine servicing of a Columbus Video Cassette Recorder (VCR) by cleaning the VCR tape heads using a cleaning tape.

LOCATION:

Installed: COL1SCAO.

DURATION:

10 minutes

CREW:

One

MATERIALS:

VTR Cleaning Tape
Marking Pen

1. CHECKIING VCR STATUS

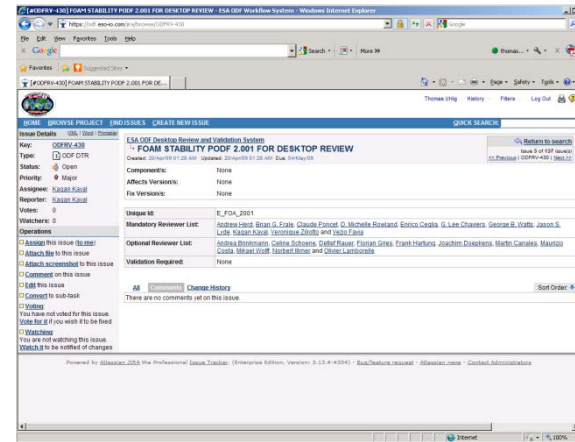


Für jede Aktivität: Eine Prozedur...

Technical
Discussions



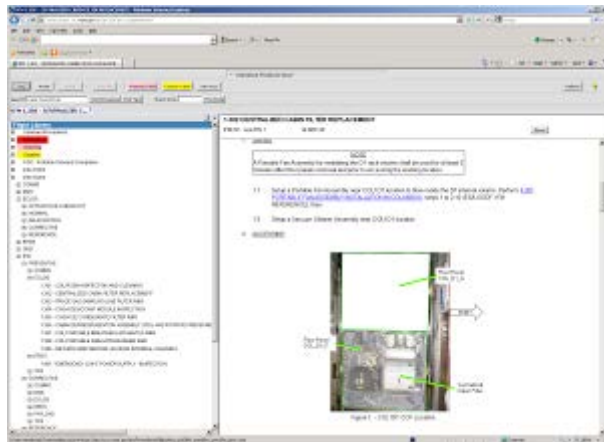
Authoring (according
to the standards)



Desktop Review



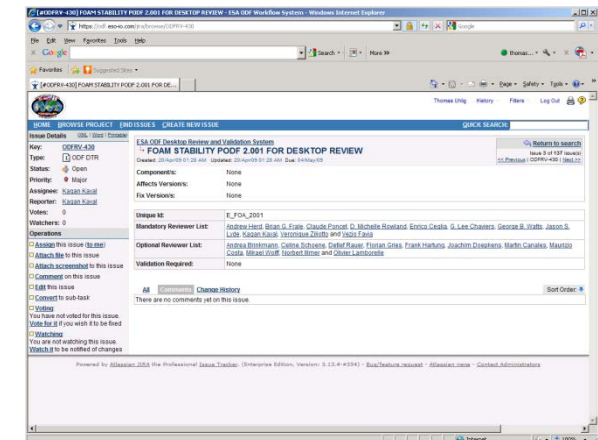
Various Steps of
procedure validation



Publication



Operations Data
File Control Board





Regelwerke: Flight Rules und Payload Regulations

„DÜSENTRIEB muss kontinuierlich gekühlt werden. Ein Kühlwasserausfall von mehr als 2hr beschädigt das Experiment“

B1-3

REAL-TIME OPERATING POLICY [RC] [E] [J] [H] ©[062603-5998] ©[052307-8165] ©[ED]

- A. NORMAL FLIGHT OPERATIONS WILL BE CONDUCTED ACCORDING TO THE STATION OPERATIONAL FLIGHT RULES (INCLUDING THE INCREMENT SPECIFIC ANNEXES) . ©[040998-6417] ©[ED]
- B. OPERATIONS DECISIONS WILL STAY WITHIN PARAGRAPH A WHEN PRACTICAL. WHEN TIME OR CIRCUMSTANCES DO NOT PERMIT THIS, THE FLIGHT DIRECTOR (AND/OR CREW COMMANDER, PER RULE {B1-7B}, CREW COMMANDER AUTHORITY AND RESPONSIBILITY) MAY CHOOSE TO TAKE ANY NECESSARY ACTION TO ENSURE THE SAFETY OF THE STATION AND CREW AND TO SATISFY MISSION OBJECTIVES. ©[ED]

IN SUCH CASES, THE FOLLOWING PRIORITIES APPLY:

1. CREW SAFETY
2. VEHICLE SAFETY
3. PROTECTION OF VEHICLE OR EQUIPMENT LIFETIME
4. CONTINUE THE PLANNED OPERATIONS ©[040998-6417]

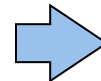


Regelwerke: Flight Rules und Payload Regulations

Technical
Discussions



Review on European Side



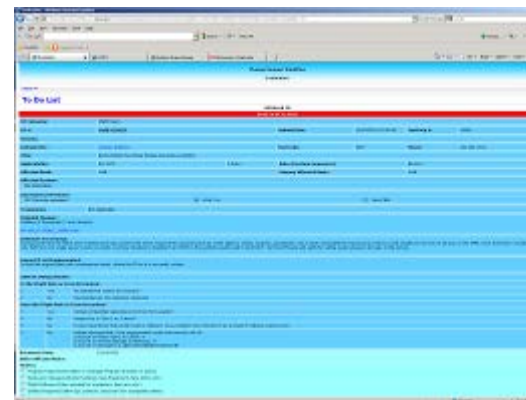
**European
Flight Rule
Control Board**

Approval on European Side



**European
Joint Ops
Panel**

Precoordination with NASA



International Review



**Flight Rule
Control Board**

International Approval



Publication





Was wäre, wenn...?

DÜSENTRIEB enthält giftige Substanzen



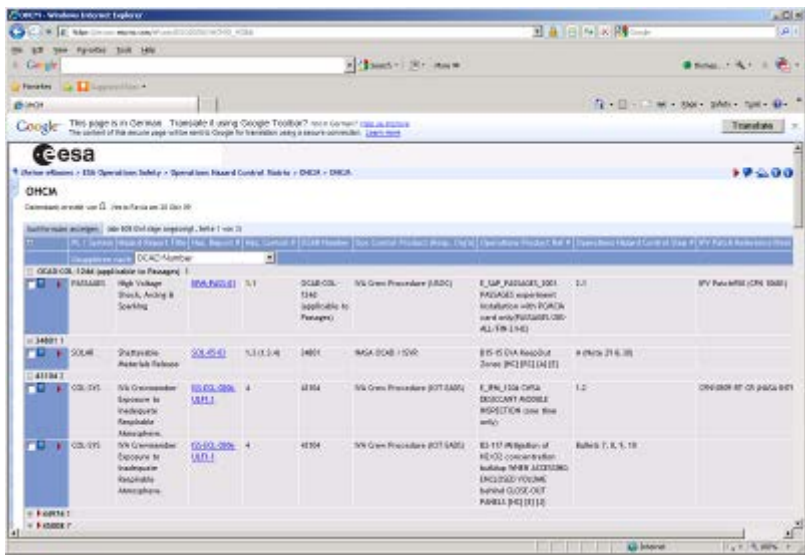
Gibt es Gefahren, für die ein „ops hazard control“ benötigt wird?



Alle Substanzen müssen klassifiziert und in der „Hazard table“ gelistet sein

Hazardous Commands									
Line ID	Report	Reference	Command Type	Operator	Classification	Priority	ADP-FLAP	Criteria for Enabling of Command	Remarks
47		ARMPUTSISDPOGDFZ.MAN.PWR.BUCOR	VTO, VSRB, DIGITAL, ON, TOUT	POLE, EPS, FC, MAN, PWR, BUC, ON, VTO	2a	VTO		Check that there are no ongoing maintenance activities (power connector mating, derating of physical tasks installed in location P1).	
48		ARMPUTSISDPOGDFZ.MAN.PWR.BUCOR	VTO, VSRB, DIGITAL, ON, TOUT	POLE, EPS, FC, MAN, PWR, BUC, ON, VTO	2a	VTO		Check that there are no ongoing maintenance activities (power connector mating, derating of physical tasks installed in location P1).	
49		ARMPUTSISDPOGDFZ.MAN.PWR.BUCOR	VTO, VSRB, DIGITAL, ON, TOUT	POLE, EPS, FC, MAN, PWR, BUC, ON, VTO	2a	VTO		Check that there are no ongoing maintenance activities (power connector mating, derating of physical tasks installed in location P1).	
50		ARMPUTSISDPOGDFZ.MAN.PWR.BUCOR	VTO, VSRB, DIGITAL, ON, TOUT	POLE, EPS, FC, MAN, PWR, BUC, ON, VTO	2a	VTO		Check that there are no ongoing maintenance activities (power connector mating, derating of physical tasks installed in location P1).	SPA-CPAG
51		ARMPUTSISDPOGDFZ.MAN.PWR.BUCOR	VTO, VSRB, DIGITAL, ON, TOUT	POLE, EPS, FC, MAN, PWR, BUC, ON, VTO	2a	VTO		Check that there are no ongoing maintenance activities (power connector mating, derating of physical tasks installed in location P1).	SPA-CPAG
52		ARMPUTSISDPOGDFZ.MAN.PWR.BUCOR	VTO, VSRB, DIGITAL, ON, TOUT	POLE, EPS, FC, MAN, PWR, BUC, ON, VTO	2a	VTO		Check that there are no ongoing maintenance activities (power connector mating, derating of physical tasks installed in location P1).	
53		ARMPUTSISDPOGDFZ.MAN.PWR.BUCOR	VTO, VSRB, DIGITAL, ON, TOUT	POLE, EPS, FC, MAN, PWR, BUC, ON, VTO	2a	VTO		Check that there are no ongoing maintenance activities (power connector mating, derating of physical tasks installed in location P1).	

„Hazardous Commands“ werden identifiziert



29S to ISS Increment 30/31
HAZARDOUS MATERIALS SUMMARY TABLE
Source: JEM

Verification Status
V-1: Preliminary Data
V-2: Final Data

Expt Hazard Account: Alloy Semiconductor

Expt Hazard Name: Alloy Semiconductor : GHF Sample Cartridges

Part No.	Label on ID-Option	Chemicals or Biological Materials	Maximum Concentration	Maximum Volume or Amount	Principal Toxic Hazards	Toxicity Hazard Level	Material Hazard Level	Record of Spill/Leak/Contamination
AS-611 (see sample)	HMST-2 29S Alloy GHF - Alloy Semiconductor Cartridge Labels: Alloy Semiconductor Sample DysSem Alloy Semiconductor Sample	GHF (9.6 mm dia x 2.1 mm long) Ga (2.18 g/sample) Sb (5.21 g/sample) GHF (9.6 mm dia x 4 mm long) In (0.72 g/sample) Sb (0.79 g/sample) Te (2.1 mg) dopant element	34.18 wt% 63.014 wt% 48.65 wt% 51.35 wt%	2 x 8.89 g * Solid sample before per sample and after processing x 5 samples (No toxicity (THL=0) (cartridge) THL in TED for On-Orbit processing. 1 x 1.48 g per sample x 5 samples (cartridge) 17.86 grams		9*	None	NA
Record of Spill/Leak/Contamination Modified: 22-Dec-2017 Contact: Yoko Iwamoto, mcmcm@nasa.gov +1-505-3362-1180 Comments: The cartridge is made of the columbian alloy C-103 which contains the sample in quartz capsule. All samples will be processed at 800 deg C and one sample will be processed for 1 hr and others for 100 hours. Preload organization provided evaporation rates for each of these alloys at planned operating temps: 800 deg C and 100 deg C. According to FT, the heat processing of the furnace will produce in U Line 590 as the target compound from GaSb and InSb.								



Was wäre, wenn...?

DÜSENTRIEB kann stations-
weite Alarme verursachen



EIS Caution & Warning Summary, v1.0

E 0 W 0 C 8 A 102 R 4

LIGHTS TONES UTILITY PROXY eis odin

EVENT#	ANNUN	CL	ACK	SYS	C&W MESSAGE TEXT	TIME OF ALARM
5013	SUPP	C		CDH	Primary INT MDM Fail-LAB	349/15:19:16
5980	ENA	C		ECL	MDM INT Detected Frame Count Fail PCA_USL-LAB	349/14:07:35
6349	SUPP	C		ECL	PCA O2 Introduction Failure-LAB	349/14:07:34

Definition der Alarme...

...und vordefinierte Reaktion

1.101 - CCS CAUTION TABLE - Microsoft Internet Explorer provided by CoCC-GSQC

IPV International Procedure Viewer

Warning Table Caution Table Services Refresh

Search: 12595 Find Procedure Find Table Event Code Find Code

1.101 CCS CAUTION TABLE

CAUTION/17A - ALL/FIN/MULTI R, E, A, P, J/SPN 30 JUL 09

EPS	PIB b1 Cntr Fail-JPM	SSIPC prime for procedure execution	11500	
EPS	PIB b1 Temp High-JPM	SSIPC prime for procedure execution	11501	
EPS	PIB b2 Cntr Fail-JPM	SSIPC prime for procedure execution	11504	
EPS	PIB b2 Temp High-JPM	SSIPC prime for procedure execution	11505	
EPS	PL Power Switch Box (PPSB) Temperature Sensor High - COL	MCC using message as system anomaly indication MCC prime for procedure execution: 3.310 - PPSE TEMPERATURE HIGH (ESA SODF EPDS: MALFUNCTION)	13682	
EPS	Power Distribution Unit (PDU1) Nominal	MCC using message as system anomaly indication MCC prime for procedure execution: 3.510 - PDU1/3	13575	





Die „Operational Interfaces“

DÜSENTRIEB benötigt einen sehr speziellen Video downlink, der über die NASA koordiniert werden muss

7.2.4 ISPR / External Payload Deactivation

PURPOSE

To define the interactions between Columbus FCT and FRC FCT while performing ISPR/external payload deactivation.

PARTICIPANTS

COL OC <SITE> OPS
COL FLIGHT

GENERAL

For performing the deactivation of an ISPR/external payload the dedicated FRC or the crew might first perform a PODF procedure (ESA ODF/<PL Facility> Book/Activation and Check-out) in order to prepare the ISPR/external payload for deactivation. Following the PODF, the Columbus FCT or the crew will perform an SODF (ESA ODF/Joint System Payload Book/Activation and Check-out) to deactivate the Columbus system services (power, water cooling, etc.).

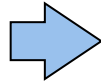
This JOIP is used to define the needed interactions on ground between the Columbus FCT and the FRC FCT w.r.t. those activities.





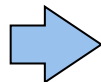
Wohin damit?

Einige Einzelteile von DÜSENTRIEB müssen an Bord verstaут werden. Eine Spezialsonde braucht Strom aus einer Steckdose

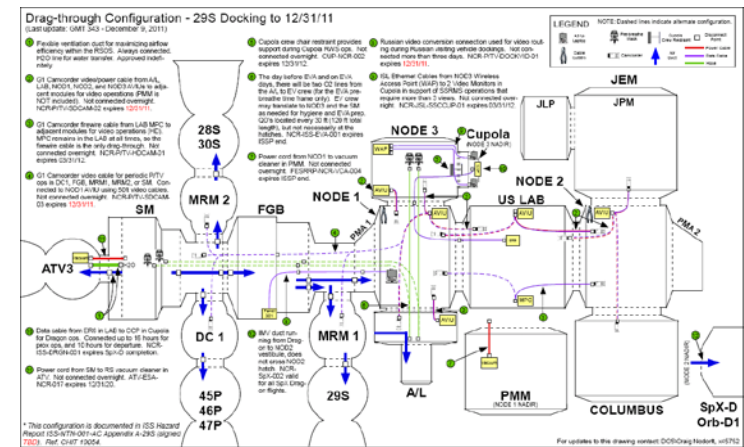


Alle Gegenstände auf der ISS sind mit ihrem Stauort gespeichert

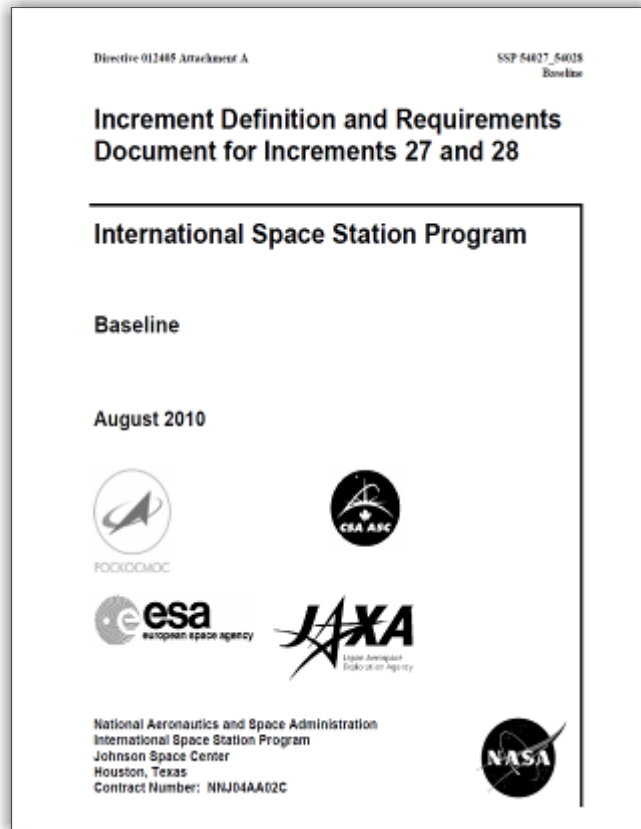
Obj Name	Parent	Label	Car Loc	BarCode	Serial#	Part#	Status	Type	Notes
ISS Search Database	Root	STP	Y	000C331M	FW	NA_2500000+000	Stowed	DO	Stowed 0000
ISS Search Database	Root	Y_KA/NL_31P		00041460P		Station Data Cable	Stowed	IQ	
ISS Search Database	Root	Y_KA/NL_31P		00041463P		Data Cable ES-372	Stowed	IQ	
ISS Search Database	Root	COL101_G5				FSL33 FM 233A	Stowed		OF NCM (no copy then not found in MDS)
ISS Search Database	Root	MOD15A_C2			1001	00040150748-301	Stowed	DO	WMS 2811-12-02 Found per Laptop at QHT 27/11
ISS Search Database	Root	CMPO_3_238		00010633	0008	00020120068-301	Stowed	IQ	Single-terminated. NCM OK. No alarm. NCM-12 at 23.11.11. NCM/monom in Lab to
ISS Search Database	Root	Y_KA/NL_2-P		0004053	1001	00020120068-301	Stowed	IQ	Trans. code: 0001-11-01-01. Found per 1800. Audit on QHT 33/11. Not MDS. NCM/monom



Jedes Einstecken, jedes Kabelverlegen ist geregelt



Dann: Planen wir's ein!



DÜSENTRIEB wird in ein Increment als Requirement aufgenommen

Wird in den
Maintenance Plan
aufgenommen

Ein Ops Concept
wird definiert (wer
kümmert sich um
was?)

Spezielle
Foto/Video-
Anforderungen
werden definiert

Das Crew
Training wird
vorbereitet und
implementiert

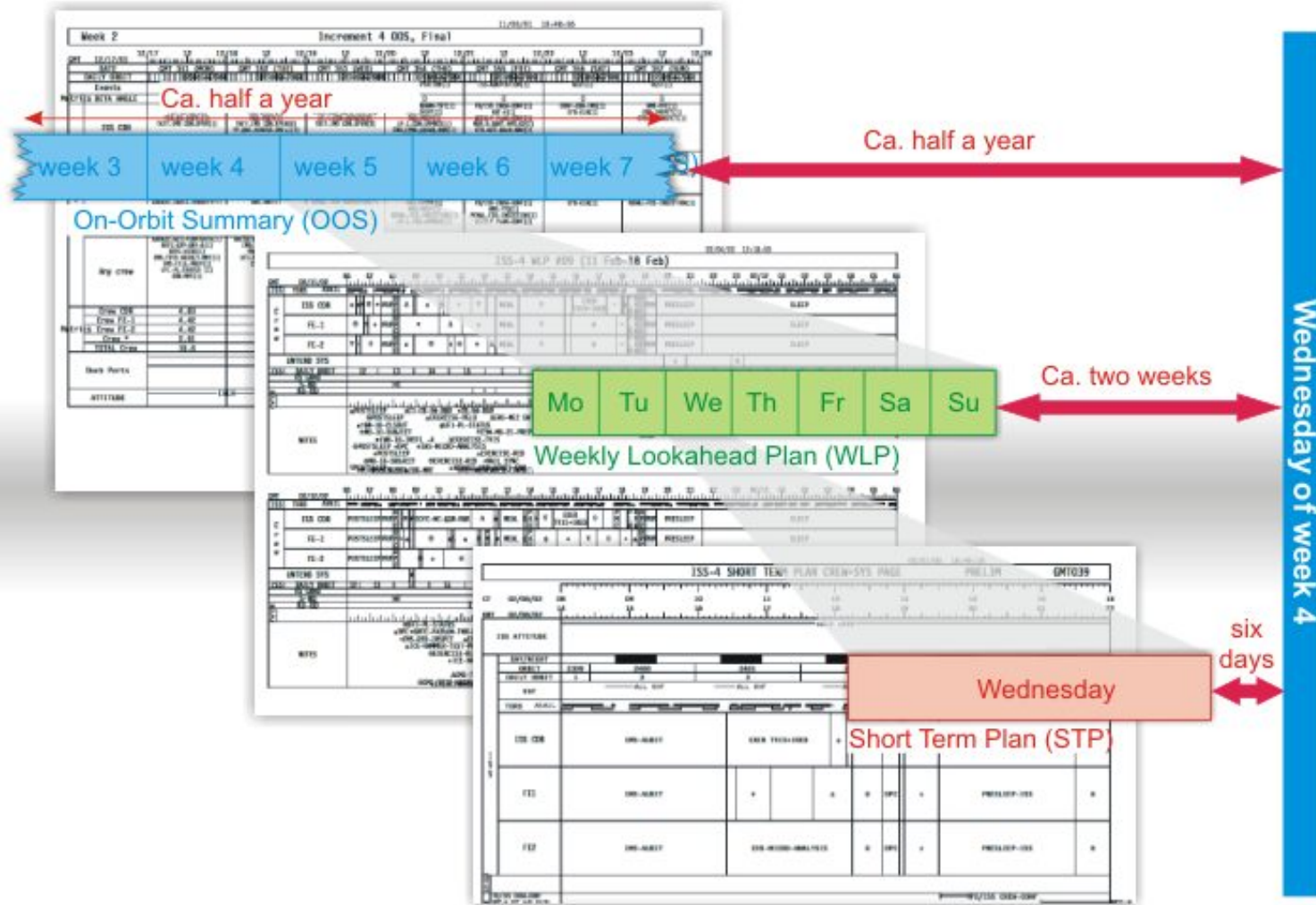
„Certification of
Flight Readiness“
(CoFR)

Die Hardware
wird „mani-
festiert“

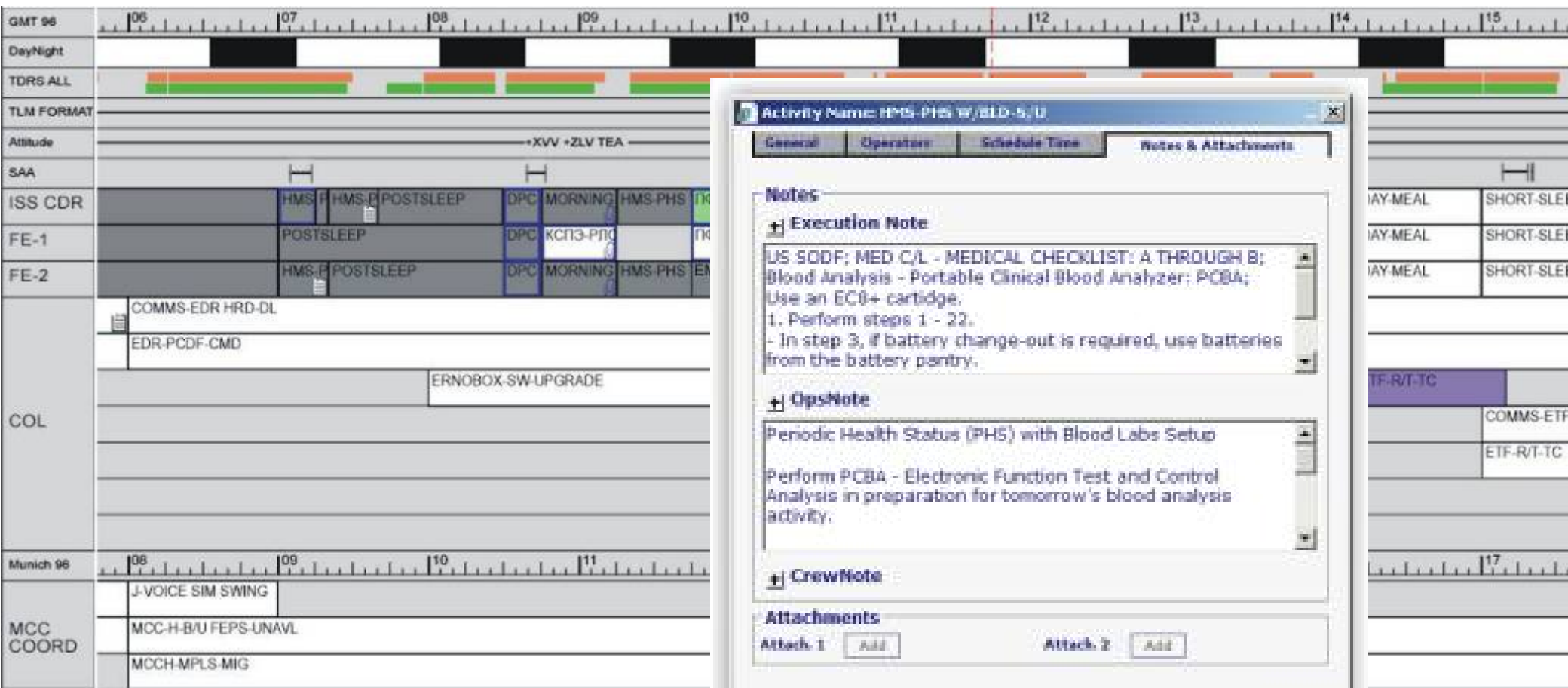
Die relative
Wichtigkeit des
Experiments wird
festgelegt



Dann: Planen wir's ein!



Dann: Planen wir's ein!





Ist jetzt alles fertig für das Experiment?

Die Erfahrung zeigt: Meistens NEIN!!

Viele Änderungen in „real-time“ und „near real-time“ treten auf



Deswegen: Flight Notes und ähnliches

EFN - Electronic Flight Notes

ESA COL-FLIGHT.TUHLIG

New Note Upd Status

Sort Flight Note GMT INPUT

STATUS - ALL -

DISCIPLINE

SUBJECT

INFO

MY ACTIVE

ALL

Activity - ALL -

PLUTO

ISO

OSO

HSG-M

PHALCON

GC

SSIPC-TSUKUBA GC

PHALCON

OPSPPLAN

ODIN

ROBO

CAPCOM

ECLSS

ESA Col-OC/COP

SURGEON

PHALCON

POIC-TCO

IMC

OPSPPLAN

POIC-OC

PHALCON

ELWIS: Uplink and Program for Events between GMT 011-017

30-0012C: Food Cue Card

30-0314 1.1.403 Emergency Egress Guidance System Inspection

GMT 011 Russian Detailed Daily Plan

Lab SPDA Jumper Removal - Big Picture Words; 30-xxxx

MCC FSW Rep Deliv, R11 ISS041 07

SSIPC Voice Format Change on GMT011 J-VOICE-MNT SWING

ULF7 Stage Solar Array Plan

FCT Review of Monday Plan

JEDI 30-0279 - X2R11 Crew Summary Message

X2R11 MSS File Uplink Request

Daily Summary Inputs for Tues 10 Jan (GMT 016)

Jumper removals and fire procedures - crew information

Content for Jedi Message 30-317 EPO FOAM Stability Setup and Summary

Uplink CEVIS exercise protocols for FE-5, GMT 009.

ULF7 Stage Solar Array Plan

SLICE Test Matrix message

Ops Tag Up Results - 01/06/12

Words to crew on deleting/missing images from SSC15

CEO Targets for GMT 010 (msg 30-0310)

ULF7 Stage Solar Array Plan

Page 1 2 3 Total records: 126

Internet

CEFN - Windows Internet Explorer

http://ost.col-oc.eupicost/cfn/note.php?mid=105451&status=Approved

CEFN

Operations Support Tools

COL-FD / uhlig [Log out]

Approved

Opened 2011/319:09:51

Revision Time 2011/319:09:51

Last Update 2011/319:10:49

CFN10823: R/T CR:COL OC MDB Changes C13

To COL-FD, MFDB-MAN

From COL-OC / Jahel Costa

Reviser COL-OC / Jahel Costa

Activity Real-Time Operations

Anomaly ☐ FR ☐ ODF ☐ Perm ☐ Others ☐

Change Request ☐ Temp ☐ Timeline ☐

Rationale:

To update the OC products in MDB prior to MDB freeze in K3 for Cycle 13.

Location (APMICOL_CC:MCS_OPSIOC)

Changes details:

- Incorporate new Biolab PPs (eDIT 29) into Monitoring list (APMICOL_CC:MCS_OPSIOC/MONITOR_LISTBLB_PP_HK_MON)
- Transfer updated USS displays to MDB (APMICOL_CC:MCS_OPSIOC/USS)

Due:

Before next MDB freeze

COL-FLIGHT DISPOSITION

Timestamp	Position	Individual	Disposition	Attach
2011/319:10:49	COL-FD	zoeschinger	Approved	

IMPLEMENTATION

Timestamp	Position	Individual	Implement Status	Attach
2011/319:10:49	COL-OC		Pending	

Comment:

2011/319:10:49 MFDB-MAN

Comment:

FN Review FD Disposition Close Out Event Log



...oder gleich ganz verschieben?

PlanManager: View Request - Windows Internet Explorer

https://ops1.jsc.nasa.gov/apps/planmanager/ViewRequest.aspx?ID=351b2171-9e1b-4c6d-a7ef-d2

Request

Request#	Rev	Discipline	Submitted By	Submitted at GMT	State
30-0664	-	ISO	NDC\khalman	010/2012 14:43	

Title: **Update Ops notes for Stowage Conference GMT 013**

Source(s): **ISO**

Constraints:

Rationale: **Points GC to updated internal note.**

Approvals

MCCB	MCCM	POIC	SSIPC	COLCC	ATVCC
A	IO	IO	IO	IO	IO

Changes

Show History ☐

Rev Plan # Change

01 Modify IMS-STOWAGE-CONF on 13/2012 at 14:05

From		To	
LRP No		LRP No	
Task List	No	Task List	No
Name	IMS-STOWAGE-CONF	Name	IMS-STOWAGE-CONF
Bands	FE-5,S-BD	Bands	FE-5,S-BD,SPECIALIST
Time Critical	Yes	Time Critical	Yes
Start Date	(013) 13-Jan-12	Start Date	(013) 13-Jan-12
Start Time	14:05	Start Time	14:05
Duration	000/00:15	Duration	000/00:15
Exec Notes	P/T	Video	No change
Ops Notes	Inventory Management System (IMS) Conference Audio Configuration (I): S/G 2 + Private 3 + Phone Patch ISS GC and Ops Plan Ref. N066942 ТЛФ-переговоры по инвентаризации (S-band)	Exec Notes	P/T
		Ops Notes	Inventory Management System (IMS) Conference Audio Configuration (I): S/G 2 + Private 3 + Phone Patch ISS GC and Ops Plan Ref. N066942B ТЛФ-переговоры по инвентаризации (S-band)

OK Print Back to top OSTPV Implementation Report

„Planning Product Change Request“



Tag der Wahrheit...



ISS020E026298

„Always expect the unexpected“

Unterstützung der Crew bei Fragen/Unklarheiten/...



Und sollte etwas schiefgehen:

1. Eine sichere Situation herstellen
2. Das Problem melden
3. Expertenmeinung abwarten

AR-15 - Windows Internet Explorer

https://sprdb.eso-io.com/sim1ars/cgi-bin/search-spr-id.cgi?sprid=15

File Edit View Favorites Tools Help

Google Search

thomas...

SPRdb®

Simulation Anomaly Report System 1 Location: [Sim1 ARS System](#) > [SIM1-ARS](#) > AR-15

AR-15

STATUS	REPORT	» ANALYSIS	ADD-ON	» TASKS	HISTORY	» NOTE
AR-15	SIM1-IOT-AR-15 NEW ROUTINE LTU SW Upgrade error					
ANOMALY CLASS	D					
CART						
SAFETY CONCURRENCE NEEDED						

SUBSCRIBE | ADD CHILD | UPDATE | PDF | EXPORT

CLASS	ANOMALY: Anomaly Report	?
STATUS	NEW	?
ORIGIN	SIMOPS-IOT-OPS	?
TITLE	LTU SW Upgrade error	?
AUTHOR	Rémon Annes	?
PRIORITY	ROUTINE	?
PRODUCT	EDR / PRODUCT GROUP: COL PAYLOAD	?
DECISION	To be assessed at SRB.	?
ACTIONEE	COL PL ENG / Ferit Oeruenver	?
TASKS		?
REMARKS		?
RELATIONS		?
ANALYSIS		?
CREATED	09-JUL-2009	?
LAST UPDATED	09-JUL-2009	?

BACK HOME HELP

SPRdb 5.4.30 | January 10, 2012 16:55 CET | Account: [tuhlig](#)

Done Internet 100%





Agenda

A repetition? - The Subsystems

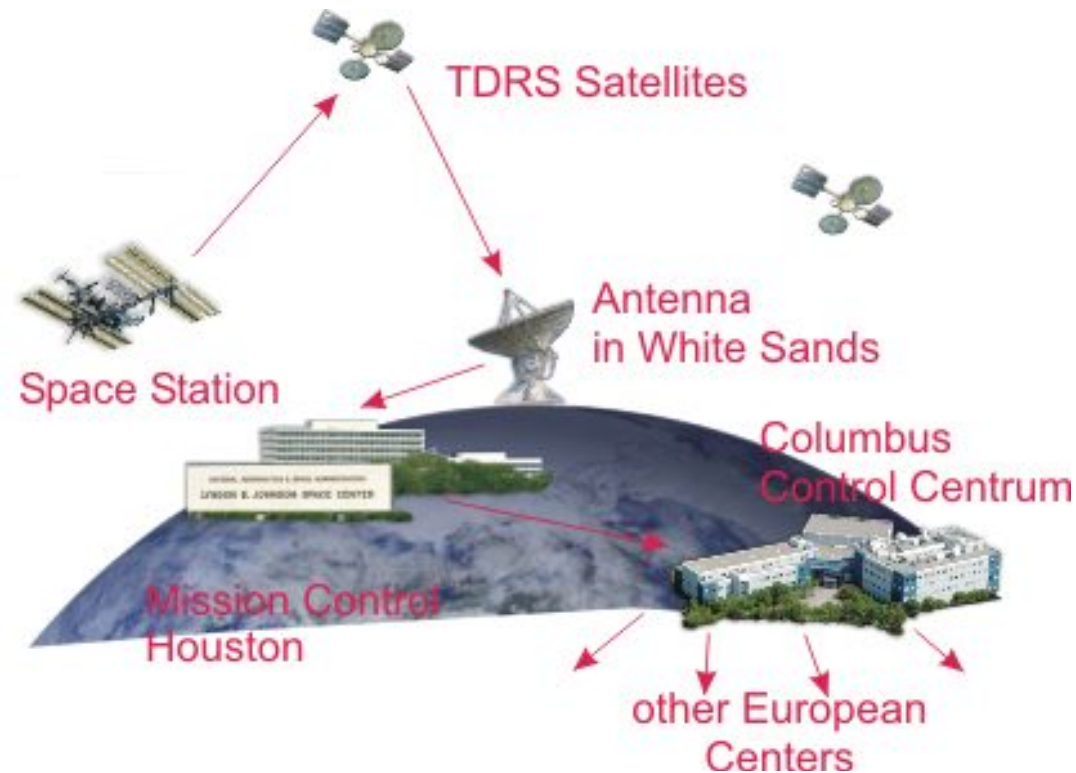
The Flight Control Team

How to conduct Operations

The Crew and Mission Control

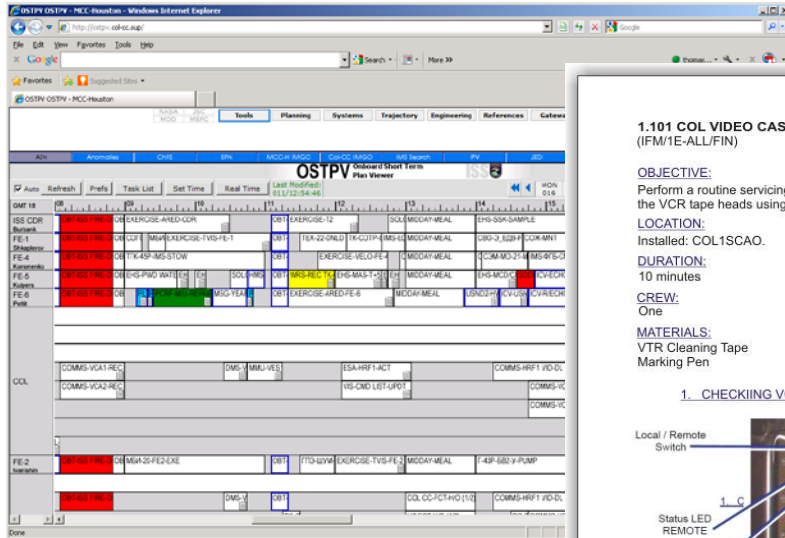


Die Verbindung zur Raumstation



- ISS kommuniziert über TDRS-Satelliten mit den Kontrollzentren
- Zwei Datenkanäle mit unterschiedlicher Bandbreite: S-Band und Ku-Band.
- Bei bestehender Funkverbindung: Vier Sprachkanäle, sechs Videokanäle, hochratiger Datenkanal, "Telemetrie" und "Telecommands"

Stundenplan, Prozeduren, Logistikinfos,...



1.101 COL VIDEO CASSETTE RECORDER SERVICING (IFM/1E-ALL/FIN) Page 1 of 4 pages

OBJECTIVE:
Perform a routine servicing of a Columbus Video Cassette Recorder (VCR) by cleaning the VCR tape heads using a cleaning tape.

LOCATION:
Installed: COL1SCAO.

DURATION:
10 minutes

CREW:
One

MATERIALS:
VTR Cleaning Tape
Marking Pen

1. CHECKING VCR STATUS

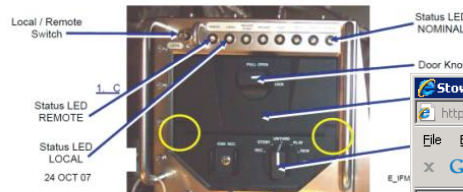


Figure 1 VCR Front Panel Instrumentation

1.1 ✓ VCR1(2) Status LED: NORMAL - ON
Refer to Figure 1

2. START / STOP CLEANING

2.1 sw LOCAL/REMOTE – LOCAL, hold for 1 sec.
Refer to Figure 1.

Verify VCR1(2)_Pwr_Stat_DMC -- OFF

cmd VCR1_Local_Setting_AP
data Onboard_Reception_Node – SYS_CCSDS_End_Point
data Onboard_Execution_Node – USM_SW_CMD_USS_S

2.2 Door Knob ⬅️ PULL OPEN, open VCR1(2) front door.
Refer to Figure 1.

CAUTION

Allow cleaning tape to run for 10 sec only.
Running tape any longer than 10 sec may
damage VCR head.

- Über Timeline (“Stundenplan”), Prozedur, Stowage Note,... wird mit der Crew kommuniziert – und sie kann auch “antworten”

Stowage Notes - Windows Internet Explorer

http://ostpv.col-cc.sup/apps/ostpv/ActASN/GetActASN.aspx?Orig_DO_ID=A00000000576F1ESCP385A_StartTime=11/2012 15:35

File Edit View Favorites Tools Help

KPS-FOAM PHOTO-ACQ - 11/15:35

#	Location	Item Name	P/N	S/N	B/C	Notes
Type: Standard						
1		EPO Foam Stability Pouch	EPO-FOAM_STABIL_1000		FOAMS45PE	
2	COL Deployed	Experiment Cell Array 1	EPO-FOAM_STABIL_1100		EXCE45P1E	
3		EPO Convection Pouch	0010.50.AA	11-599	CONP45P1E	
4	COL1D4_C2	Convection Loop	0010.05.AA	11-595	CONL45P1E	
5	LAB1_Deployed	Shure Microphones	SM58SE	001	HDMIC01N	
6		D2Xs Camera				
7	Crew Pref	Multi Use Bracket				

Done

Internet 100%



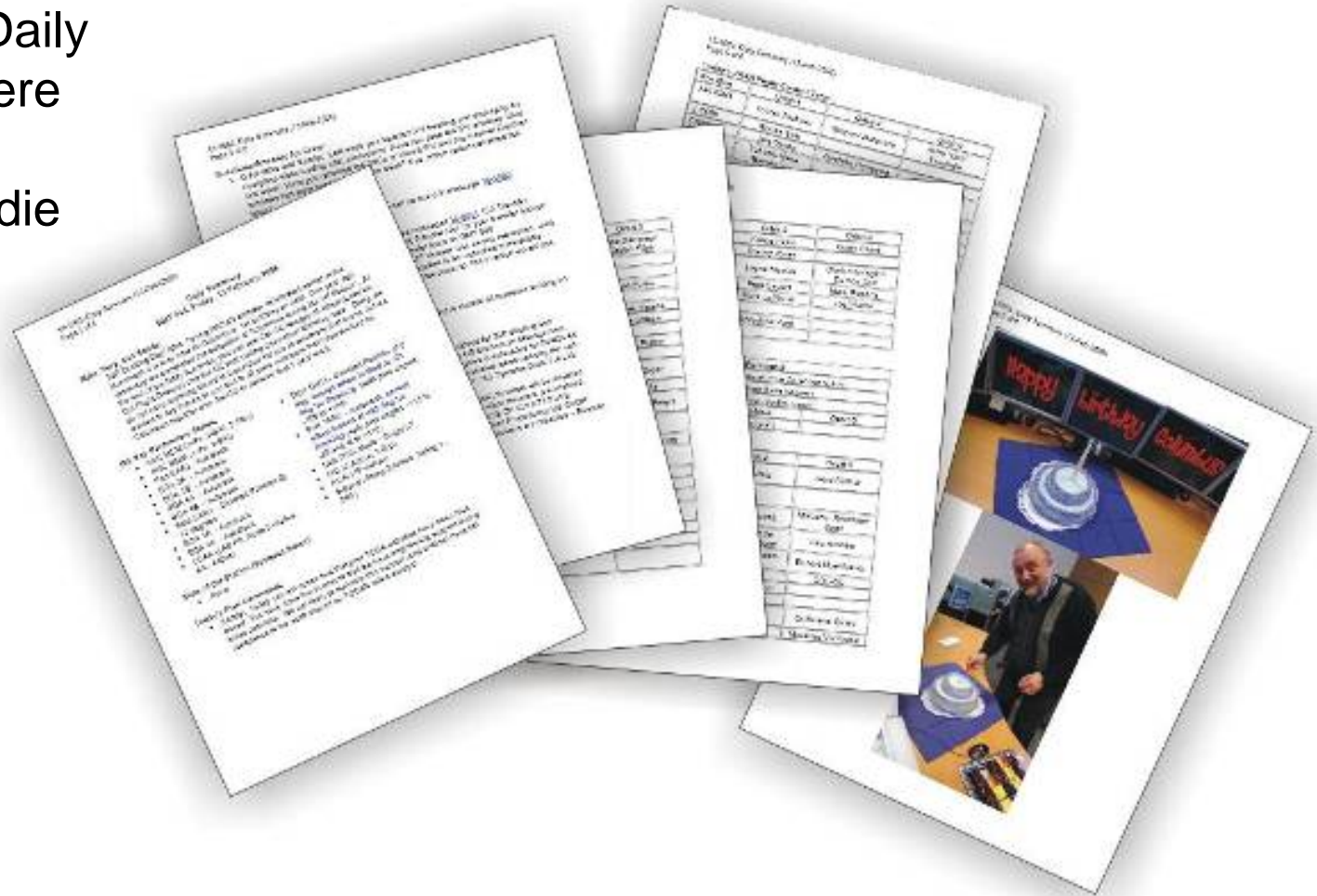
Die Sprachkommunikation



- Nur zwei geplante Gespräche mit der Crew pro Tag
- Zusätzliche Kommunikation im Fall von Fragen/Problemen oder falls die Prozedur es verlangt.
- Nur eine Person im Kontrollzentrum darf mit der Besatzung sprechen (EUROCOM)

Die geschriebene Kommunikation

- Über ein tägliches “Daily Summary” (und andere regelmässigen Dokumente, die auf die Station geschickt werden) wird die Besatzung auf dem Laufenden gehalten



Video...

- Quasi kontinuierlich sind sechs Videokanäle von der Raumstation verfügbar.
- Videokonferenzen (auch der Astronaut bekommt Video vom Gesprächspartner) sind möglich



ISS018E032150



Weitere Kommunikationsmittel

- Die Besatzung hat Zugang zu “privaten” und “operationellen” Emails
- „Vertrauliche“ Konferenzen der Besatzungsmitglieder mit den jeweiligen zuständigen Flugdirektoren
- „Vertrauliche“ regelmäßige Konferenzen zwischen Crew und ihrem Flugarzt/Psychologen/Familie
- Besatzung kann über VoIP jedes „Erdtelefon“ anwählen
- Crew hat Zugang zum Internet



Kommerzialisierung

- Der Betrieb wird zunehmend geprägt von kommerziellen Nutzern
- Beispiele auf ISS: **Bartolomeo** externe Plattform (Bild oben), **Ice Cubes** (Bild unten)
- Die Anforderungen an den Betrieb werden dadurch anders
- Globale Plattformen, wie Netzwerk HUBs werden onboard verwendet
- Nutzer wollen Ressourcen flexibel nutzen
- Handling muß für Nutzer einfach gestaltet werden
- Harmonisierung mit ISS Operations

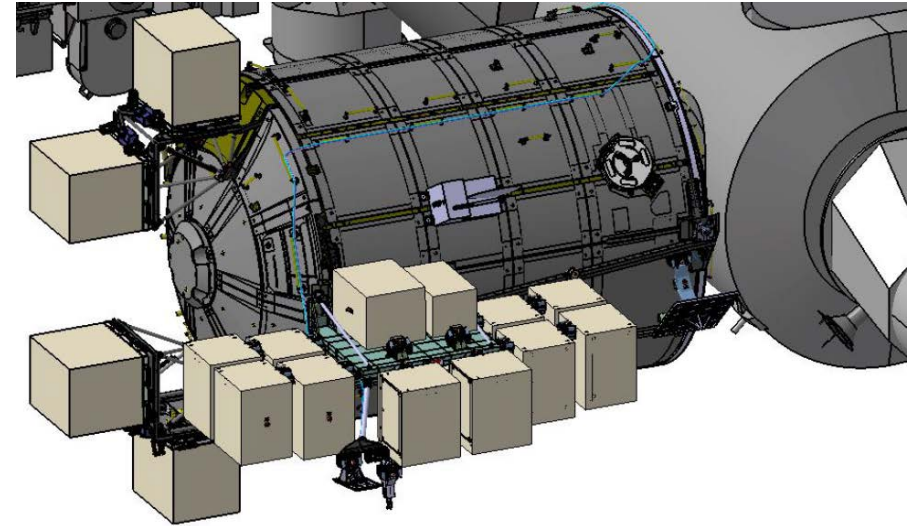


Bild: Airbus, IAC-18.B3.4-B6.4.7

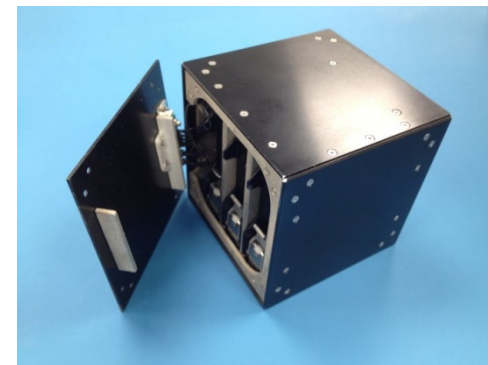


Bild: ESA



Agenda

A repetition? - The Subsystems

The Flight Control Team

How to conduct Operations

The Crew and Mission Control



Literatur

- [1] **FLIGHT – My life in Mission Control**, Ch. Kraft, Plume (2002).
- [2] **Handbuch der Raumfahrttechnik**, W. Ley, K. Wittmann, W. Hallmann (Hrg.), Carl Hanser Verlag, 5. Auflage (2019).
- [3] **Wie Columbus fliegen lernte**, T. Uhlig, A. Nitsch, J. Kehr, Hanser Fachbuch, 1. Auflage (2010).
- [4] **First experience with realtime operations of the Columbus Module**, D. Sabath, D. Schulze-Varnholt, 59th International Astronautical Congress, IAC-08-B3.3.3, Glasgow (2008).
- [5] **Spacecraft Operations**, T. Uhlig, F. Sellmaier, M. Schmidhuber, Springer (2014).



Kontakt

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 - Daniel Pütz



Backup Slide: ESA Crewmembers on ISS

- Alexander Gerst auf ISS: Was ist anders für das Kontrollzentrum?
- Vorbereitung:
 - Kontakt mit ESA Astronauten
 - Besprechung von Präferenzen
- Durchführung:
 - ESA Crew Conference
 - Kontakt per Email / IP Phone
 - Tasklist handling
 - PAO Events
 - Presse am Kontrollzentrum



(Bild: ESA)

Backup Slide: ESA Crewmembers on ISS

- Nachbereitung:
 - Zusätzliches Crew debrief in Europa
- Generelle Hinweise zur Crewzeit
 - Crewzeit wird nicht nach Herkunft verteilt, das heißt ESA crew arbeitet nicht nur an ESA Aufgaben
 - Entscheidend ist das Training Level für spezielle Aufgaben, das jeder Astronaut individuell erhalten hat.
 - Russische Crewzeit ist nur bei speziellen Vereinbarungen verfügbar



(Bild: ESA)